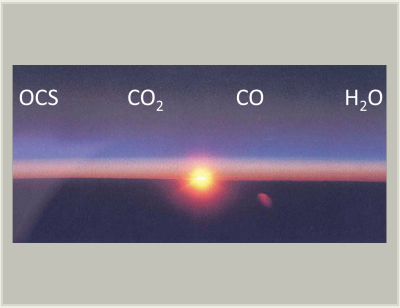
Ultrasensitive Analyzer for Real-time, In-Situ Airborne and Terrestrial Measurements of OCS, CO2, and CO, Phase II

Completed Technology Project (2012 - 2016)

Project Introduction

In this SBIR effort, Los Gatos Research (LGR) will employ its patented mid-infrared Off-Axis ICOS technique to develop a compact carbonyl sulfide (OCS), carbon dioxide (CO2), carbon monoxide (CO), and water vapor (H2O) analyzer. This sensor will provide rapid (10 Hz), real-time, accurate measurements of these important trace gases with minimal calibration. The SBIR instrument will be capable of both terrestrial and airborne deployment to provide data in the troposphere, tropopause, and stratosphere. The resulting system will allow NASA researchers to acquire data that complements satellite observations made from missions in the Earth Observing System. The data will help elucidate stratospheric aerosol loading and terrestrial CO2 fluxes to improve climate models. Phase I, LGR demonstrated technical feasibility by fabricating an Off-Axis ICOS system for OCS, CO2, CO, and H2O quantification in ambient air. The prototype was highly precise (OCS, CO2, CO, and H2O to better than ±4 ppt, ±0.2 ppm, ±0.31 ppb, and ±3.7 ppm respectively), linear (R2 > 0.9997) over a wide dynamic range, and fast (2-Hz response), with no appreciable cross-interference between the measured species. Subsequently, LGR deployed the Phase I prototype locally and at a DOE Ameriflux site (Sherman Island, California). Phase II, LGR will develop and deliver two autonomous OCS, CO2, CO, and H2O analyzers for terrestrial flux and airborne monitoring respectively. The first analyzer, which will measure these gases at up to 10 Hz in a variety of terrestrial ecosystems, will be tested with Professor Chris Still for long-term monitoring and Professor Dennis Baldocci for eddy-flux measurements. The second instrument will be packaged for deployment aboard a select NASA aircraft, and include provisions for ambient temperature, humidity, and pressure fluctuatons. The flight sensor will be tested using a modified Mooney TLS with Dr. Stephen Conley and then deployed aboard a NASA aircraft.



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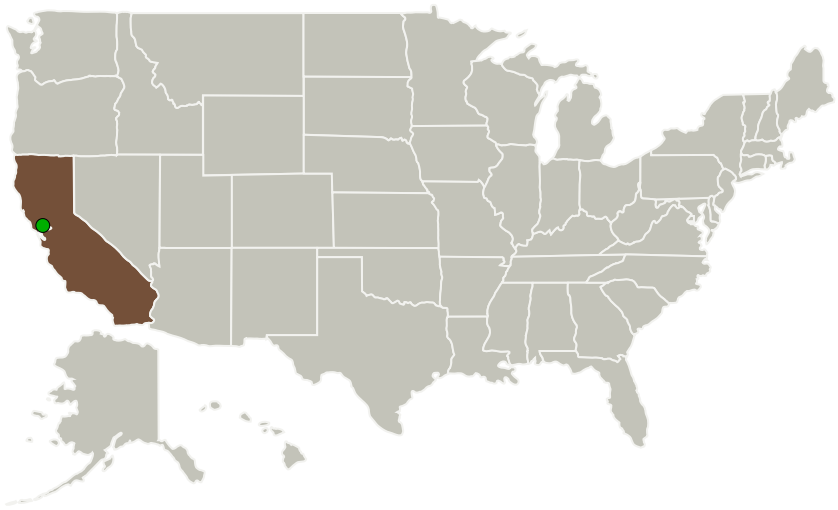
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Los Gatos Research	Lead Organization	Industry	Mountain View, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Project Transitions

December 2012: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Los Gatos Research

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Manish Gupta

Co-Investigator:

Manish Gupta

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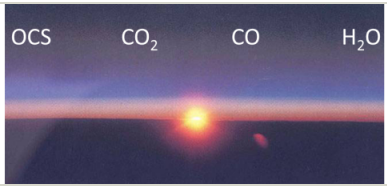
March 2016: Closed out

Closeout Summary: Ultrasensitive Analyzer for Realtime, In-Situ Airborne and Terrestrial Measurements of OCS, CO2, and CO, Phase II Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139402)*

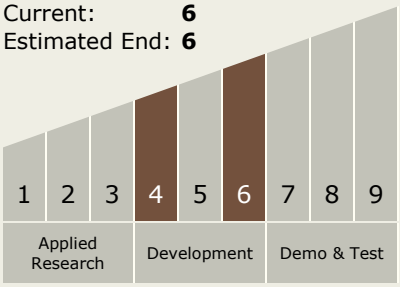
Images



Briefing Chart Image
Ultrasensitive Analyzer for Realtime, In-Situ Airborne and Terrestrial Measurements of OCS, CO2, and CO, Phase II *(https://techport.nasa.gov/image/130562)*

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System